

Name: Muhammad Sulaiman

ID# 7925

Section: A

Degree: BE Civil

Instructor: Engr. Fasham

Date = 24-06-2020

Semester 4th  
Advance Engineering Survey

Q# 1: What is transition curve?

Answer: A transition curve may be defined as a curve of varying radius of infinity at tangent point to a design circular curve radius provided in between the straight and circular path in the order that the centrifugal force was gradual. This is also known as easement curve. The objective of providing transition curve are given below.

1: The gradually introduce the centrifugal force b/w the tangent point and the beginning of

the circular curve <sup>3</sup> ~~the~~ thereby avoiding <sup>(2)</sup>  
sudden jerk on the vehicle.

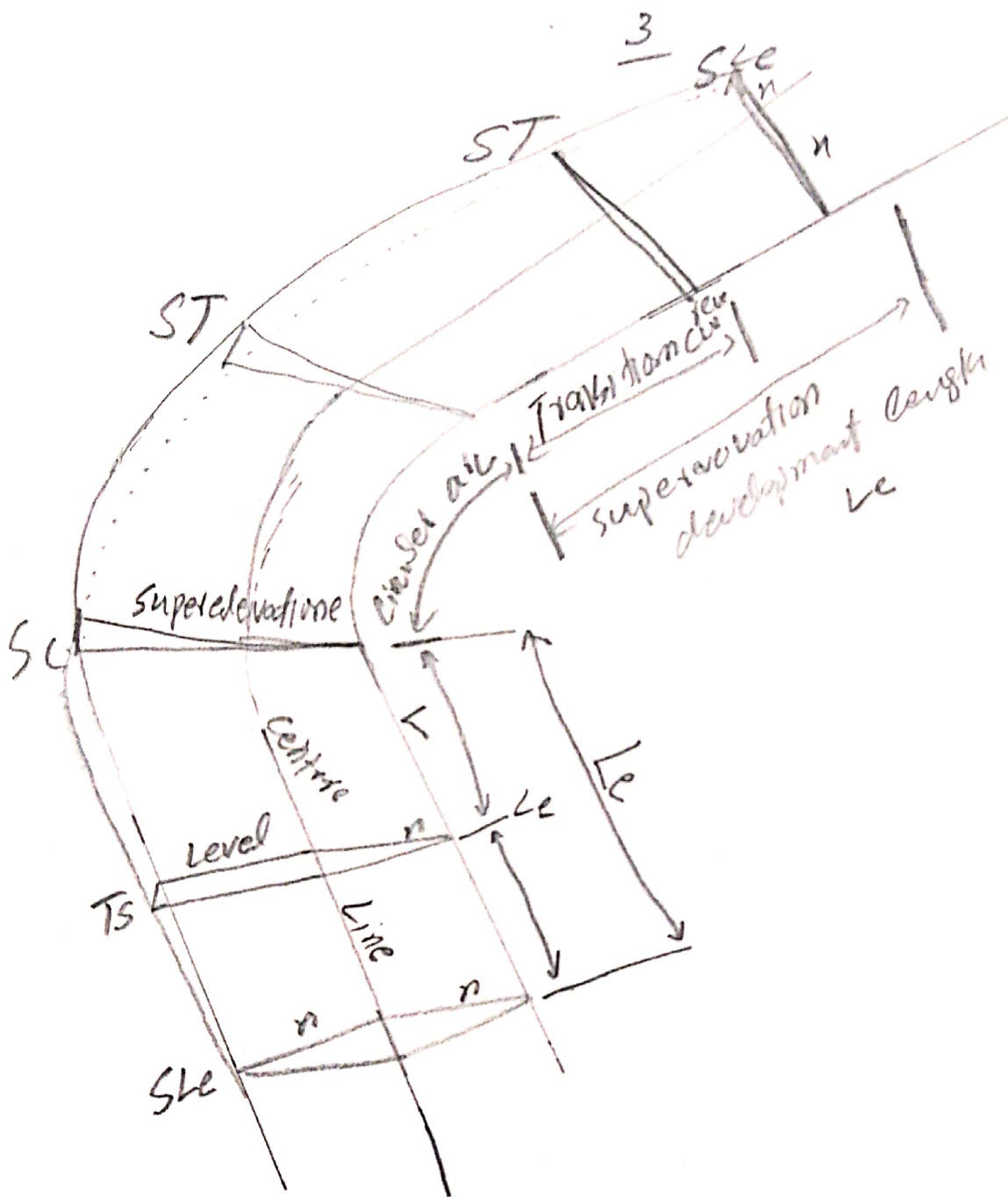
(2) To increase the ~~comfort~~ comfort of passengers.

(3) To ~~introduce~~ introduce designed superelevation at a desirable rate.

(4) To enable the driver to turn the steering gradually for his own comfort and security.

(5) To ~~introduce~~ design extra widening at a desirable rate.

(6) To enhance the aesthetic appearance of the road.



Superelevation: It is the amount of by which the outer edge of a curve of curve a road or railway is banked above the inner edge when a vehicle passes to a curved path the following force acts on it.

- i) Weight of vehicle
- ii) Centrifugal force both acting through centre of gravity of vehicle.

The effect of centrifugal force is to push the vehicle off the track. Now to counteract the action the plane of the road surface is made perpendicular to resultant of centrifugal force and weight of vehicle. In other words the outer bank is over the inner one is known as superelevation.

(8)

Mathematically;

$w$  = weight of the vehicle  
 $P$  = centrifugal force

$v$  = speed of the vehicle, m/s

$g$  = Acceleration due to gravity,  $m/s^2$

$R$  = Radius of the curve, m  
 $h$  = super elevation

$b$  = width of the road, m

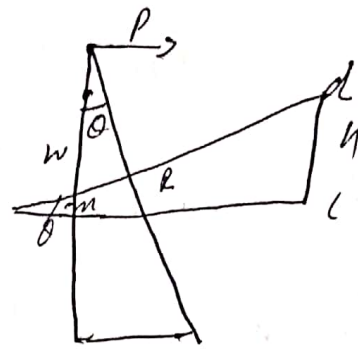
for equilibrium the resultant  $R$

of the  $P$  and  $w$  must be equal and opposite to the reaction perpendicular to road or said surface.

As we know that

$$P = \frac{w v^2}{gR}$$

$$\Rightarrow \frac{P}{w} = \frac{v^2}{gR}$$



If  $\theta$  is the inclination of road surface to vertical  
the inclination of resultant  $\theta$   
is also  $\theta$

So we have

$$\tan \theta = \frac{dc}{ac} = \frac{P}{W} = \frac{bv^2}{gR}$$

On Road

$$b \tan \theta = \frac{v^2}{gR}$$

On Railway,  $b \tan \theta = \frac{Gv^2}{gR}$

$$\text{Radius} = b \tan \theta = \frac{v^2}{gR}$$

$$R = \frac{v^2}{b \tan \theta g} \quad (\text{For road})$$

$$b \tan \theta = \frac{Gv^2}{gR}$$

③ ⑦

speed of vehicle

$$b \tan \theta = \frac{v^2}{gR}$$

$$v^2 = b \tan \theta gR$$

$$v = \sqrt{b \tan \theta gR}$$

(For road)

$$b \tan \theta = \frac{Gv^2}{gR}$$

$$v^2 = \frac{b \tan \theta gR}{G}$$

$$v = \sqrt{\frac{b \tan \theta gR}{G}} \implies (\text{for railway})$$



The end of Q# 1



Q#2

Answer : Difference b/w triangulation and Trilateration.

Triangulation	Trilateration
1) All angles are measured in triangulation	1) All sides are measured in trilateration.
2) Distance of base line measured	2) Azimuth of the initial line is measured
3) Some check baseline is measured to control scale error	3) Some check angles are some measured to control azimuth error.
4) Inter visibility b/w stations is essential.	4) For small areas it is possible to measure distances without intervisibility.
5) There are more internal check in comparison with trilateration in the same geometric figure	5) There are less internal check in comparison with triangulation in the same geometric figure
6) The side length are computed on the basis of measured angles applying sine law	6) The angles are computed on basis of measured side length applying cosine law

# Principle of triangulation.

∴ if all the three angles and the length of one side of a triangle are known, then by trigonometry the length of the remaining sides of the triangle can be calculated.

• Again, if the coordinates of any vertex of the triangle and azimuth of any side are also known then coordinates of the remaining vertices, may be computed.

• To minimize accumulation of errors in length, subsidiary bases at suitable intervals are provided.

**Trilateration** :: The method of surveying in which the length length of the sides of a triangle are measured and from this information angle are computed.

### Principle of trilateration:

- Method of control survey in which a network of triangles is used as in triangulation system.
- All the three sides of each triangle are measured in the field with the distance measuring instruments (EDMs, tapes, other apparatus).
- Horizontal angle are not measured in the field.
- Angles in a trilateration system are computed indirectly

from the length of the sides  
triangle or by cosine formula.

• few horizontal angles are also  
sometimes measured to provide  
a check on computed angle.

• Trilateration is adjusted after  
the computation of the angle  
and then coordinates of the  
stations are determined.

• vertical angles are also measured  
where elevation have not been  
established

cosine Rule

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$2bc \cos A = b^2 + c^2 - a^2$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$A = \cos^{-1} \left( \frac{b^2 + c^2 - a^2}{2bc} \right)$$

The end of Q#2

Q#3)

Answer: Hydrographic survey: It is the branch of surveying which deals with water bodies e.g. Lake, river etc.

OR  
Hydrographic surveying or bathymetric surveying is the survey of physical features present under water.

It is science of measuring all factors beneath water that effect all

The marine activities like dredging marine construction off shore drilling etc.

→ Hydrographic surveying is mainly conducted under authority concern

It is mainly carried by means of sensor. Standing or electronic sensor system for shallow water

Why we do Hydrographic surveying:-

- 1) Depth of bed can be determined
- 2) Shore lines can be determined
- 3) Locating sewer fall by measuring direct current
- 4) Locating mean sea level
- 5) Tide measurement
- 6) River and stream discharge measurement
- 7) Massive structures, like, bridges, dams, harbors are planned

14)

⇒ Factor to be determined while conducting Hydrographic Survey..

← Following are the factors which would be done while doing and conducting Hydrographic surveying. →

- a) Surveying Equipment
- b) preparation of a hydrographic survey specification. (To include a review of existing data)
- c) Issue to a designated unit.
- d) programme planning of that unit
- e) assesment of the task with in that unit
- f) Reconnaissance requirement.

(15)

- h) Detailed survey planning
- i) plans for complication and checking of data

← The end of Q#3 part A →

## Q#3 part - b

∴ Sounding: The measurement of depth below the water surface is called sounding. This corresponds to the ordinary spirit leveling in the land surveying where depth are measured below horizontal line established by level. The object of making sounding in this to determine configuration of the subaqueous source.



## => Purpose: of Sounding:

-> Sounding is most important for any water body to improve its negligible properties. to know about silting and scouring etc.

-> In hydrographic surveying sounding is the measurement of depth below the water surface

-> In short the main purpose and objective of sounding to measured and finding the depth below the water surface.

- =>
- 1) Sounding boat
  - 2) Sounding rod and poles
  - 3) lead lines.
  - 4) Sounding Machine
  - 5) Fathometer.

Q#

# Q#4 Part — A (a)

Aerial photogrammetry:

Aerial photogrammetry is process in which an aircraft with camera is used to take photograph from cert air height in the air. A ~~min~~ minimum 3 to 4 control point needed in are photograph.

Reasons for use to Aerial photogram<sup>etry</sup>  
 following are some of the reasons  
 for used of Aerial photogram<sup>metry</sup>

→ It is used because it provides  
 compute model generated 2D and 3D  
~~models~~ models ~~models~~ are

~~photo~~ topog

18

topographical in nature.

They represent the dimensions and physical features of the area of land and in starting accuracy

These model can be related and zoomed.

→ Along with survey map of of the uses of Aerial photogrammetry in different fields.

---

The end of Q# 4

part - a

Q#4 part - b

Procedure of Aerial photography:

The main steps of Aerial photography.

- 1) Establishing control point
- 2) flight planning and photography
- 3) photo interpretation and  
stereoscopy.
- 4) parallax and measurement  
of parallax
- 5) construction of map and  
cartography.

→ 4) Establishing control points: Control points are points established on ground with known relative position. The photography captured as observed by setting there control point as boundaries. There should be minimum 3 to 4 point (central point) in a photography.

Flight planing and photography  
 Flight planing is actually knowing the height to be maintained while taking photo area to be covered in each photo graph, Number of photo graph. Number of strips and line interval b/w exposures

The end of Q#4 part b